Enhancing Metacognition Over the First Semester of Pharmacy School with Longitudinal Self-Reflection

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Key Takeaway

Promoting effective learning strategies and longitudinal self-reflection enhances metacognitive awareness and shifts toward more effective and active study techniques, habits, and methods within a semester.

Introduction

- Metacognition is "thinking about how we think" or "knowledge concerning one's cognitive processes."
- Passive strategies require learners to take on a more active role, such as practice testing or self-explanation.
  - Instructing students about effective strategies appears to lead to students' more significant endorsement of them.
- Assessing knowledge and guiding students to use effective learning strategies helps improve academic achievement.
  - It also measures study habits, skills, and attitudes.
- Exam wrappers, questionnaires, and surveys can be used to assess when, how, and then what level of effectiveness is helpful to meet specific goals and generate extensive data sets.

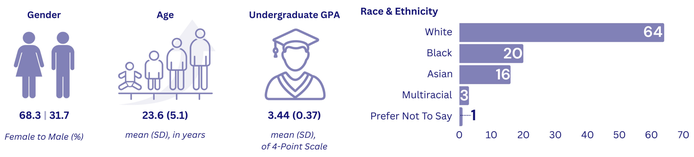
Study Objective

- This study aimed to assess the effects of a longitudinal, semester-long self-reflection assignment on metacognition in first-year pharmacy students.

Methods

- All first-year students (n=104) matriculating into the Doctor of Pharmacy (PharmD) program at UTHSC COP (*Fig. 1*)
  - Approval to conduct this study was granted by the UTHSC IRB
- In the Fall, all students completed a series of **two assessments** as part of a self-reflection exercise, including:
  - The **pre-assessment** during the first week of school (**August**) to characterize a student's undergraduate/prerequisite study habits/practices before pharmacy school.
  - The **post-assessment** following the last exam of the semester (**December**) - to characterize a student's undergraduate/prerequisite study habits/practices after the first semester of pharmacy school.
- These exercises consisted of a set of Likert-type, multiple-choice, and free-text questions to:
  - Assess metacognitive development *(Fig. 2)* across domains: *test-taking approach (TT), understanding of content (UC), study habits, and time management skills (SH)*
  - Investigate students' incoming/track changes in study habits and practices (*Fig. 3*)
  - Characterize student-reported *frequency of use* and *effectiveness* of specific strategies and learning styles (*Fig. 4*)
- Comparisons were made between the pre- and post-assessment responses using descriptive statistics and were analyzed using IBM SPSS Statistics for Mac (Chicago, IL, v. 28)

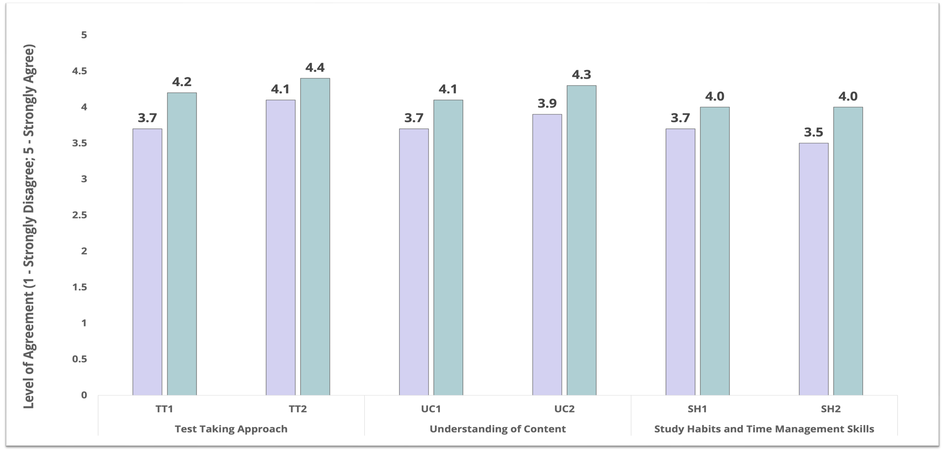
Figure 1. Student demographics for first-year students (P1) – class of 2027.



Results

pre-assessment | post-assessment

Figure 2. Likert-type statements ranked based on metacognitive development by domain.



Test Taking Approach

I remained calm and composed during exams, which allowed me to perform to the best of my abilities.	**TT1**
I practiced effective time management and exam-taking strategies to ensure I had enough time to answer all the test questions.	**TT2**

Understanding of Content

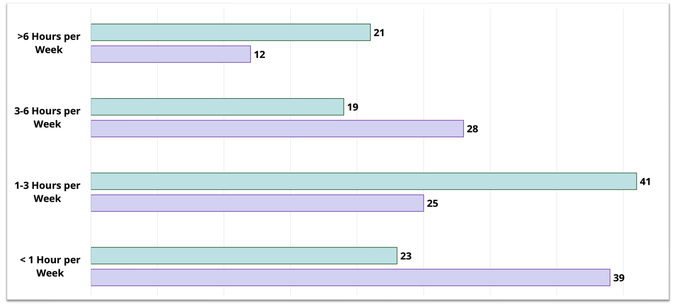
I actively sought clarification and engaged in discussions to deepen my understanding of complex topics.	**UC1**
I actively sought learning resources and study materials to enhance my understanding of subjects.	**UC2**

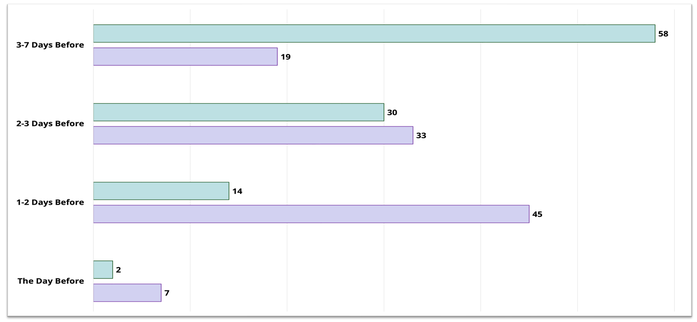
Study Habits and Time Management Skills

I consistently dedicated time daily to studying and completing assignments.	**SH1**
I was confident in managing time effectively and balancing academic commitments with my personal life.	**SH2**

Figure 3. Study habits or strategies at baseline and the end of the semester.

*How many **hours per week** do you spend preparing for an exam?*





*How many **days before an exam** do you start studying for an exam?*

Figure 4. Student rankings of study habits or strategies, based on the frequency of use (1-never use to 5-always use) and effectiveness (1-not effective to very effective), by lowest (a) and highest (b)

a. Lowest Ranked	Frequency of Use			Effectiveness		
Study habit or strategy	**Pre** Mean (SD)	**Post** Mean (SD)	**% Change**	**Pre** Mean (SD)	**Post** Mean (SD)	**% Change**
• Reading and taking notes from the textbook	2.3 (1.0)	1.7 (1.2)	-25.8%	2.8 (1.1)	2.0 (1.3)	-26.6%
• Reading and highlighting the textbook	1.9 (1.1)	1.5 (1.0)	-20.8%	2.2 (1.0)	1.8 (1.2)	-18.1%
• Reading the textbook only	1.6 (0.8)	1.4 (0.9)	-16.6%	1.8 (0.9)	1.5 (1.1)	-14.2%
• Re-reading the textbook without taking notes	1.7 (0.8)	1.4 (1.0)	-14.9%	1.9 (1.0)	1.7 (1.2)	-8.8%
• Only reviewed the study guide	2.3 (1.2)	2.3 (1.1)	-3.3%	2.6 (1.4)	2.7 (1.3)	4.9%

b. Highest Ranked	Frequency of Use			Effectiveness		
Study habit or strategy	**Pre** Mean (SD)	**Post** Mean (SD)	**% Change**	**Pre** Mean (SD)	**Post** Mean (SD)	**% Change**
• Instructor's practice problems	4.1 (1.0)	4.2 (0.7)	3.0%	4.5 (1.0)	4.3 (1.0)	-4.5%
• Reviewing/re-reading lecture notes	4.2 (0.9)	4.3 (1.0)	3.0%	3.9 (0.9)	4.0 (1.2)	4.5%
• Reviewing/re-reading PowerPoint® Slides	4.4 (0.9)	4.6 (1.0)	3.9%	4.1 (0.7)	4.4 (1.0)	7.1%
• Self-testing/retrieval practice	3.9 (1.2)	4.1 (1.0)	6.4%	4.3 (1.0)	4.3 (1.0)	0.0%
• Spacing out studying Interleaving study	3.2 (1.2)	3.9 (1.1)	21.1%	3.8 (1.1)	4.2 (1.1)	11.0%

Conclusions

- Over the first semester, students reported an increased agreement with all statements assessing the metacognitive development within the domains: test taking, understanding of content, and study habits and time management (ranging from *+0.3 - 0.5*)
- By the end of the semester:
  - *15.4%* more students reported spending 1-3 hours per week (*n=41*) preparing for an exam, compared to before (*n=25*)
  - *37.4%* more students reported started studying 3-7 days before an exam *(n=58)*, compared to before (*n=19*).
- Strategies related to textbook-based study habits were ranked as the least effective and less frequently used, including reading and taking notes, reading and highlighting, reading only, and re-reading.
- Highly effective and more frequently used study habits or strategies included reviewing/re-reading lecture slides, self-testing/retrieval, and spacing out studying interleaving study.
  - Spacing out/interleaving study had the most significant increase in frequency and efficacy while self-testing/retrieval practice was already high at baseline.
- Future research is needed to explore these items' relationship with academic performance and student success.

References

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